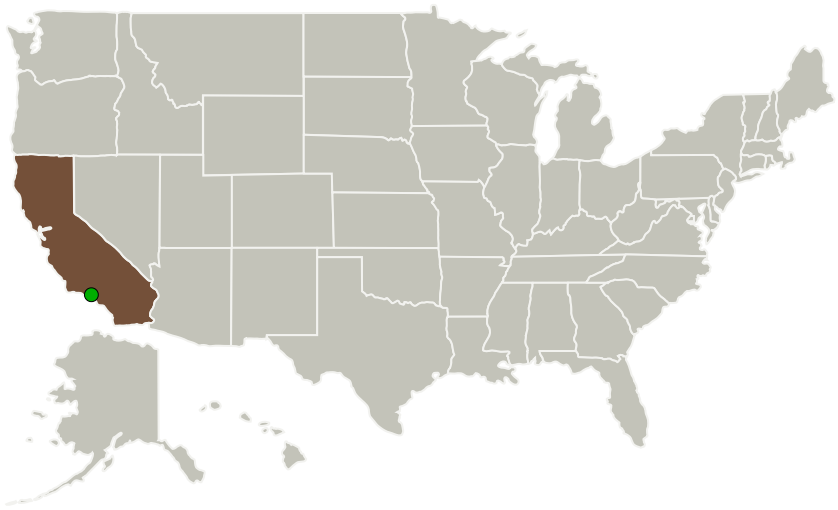
Single-Stage, Gelled Hydrazine System for Mars Ascent Vehicle Propulsion, Phase I

Completed Technology Project (2015 - 2015)

Project Introduction

Microcosm, Inc. in cooperation with Aerojet Rocketdyne is presenting an innovative approach to the Mars Ascent Vehicle (MAV). The single-stage monopropellant system offers the substantial advantage of simplicity, while providing operational flexibility. The projected result offers low cost at high reliability. Our proposed concept employs a gelled hydrazine monopropellant which provides low temperature capability (-54 ?C/ 65 ?F demonstrated), thus reducing the thermal conditioning demand on the Entry Descent Lander (EDL). Precision pointing at the time of launch is not required due to the relatively low, under 10g's, initial acceleration and high control gain provided by the articulated plug nozzle, enabling the use of a single degree-of-freedom EDL launch platform. This proposal combines the strength of a previous proposal submitted to NASA's Planetary Sciences Division, in May of 2010, with the particular expertise of Microcosm Inc. in space mission design as well as its advanced all-composite pressurized structures technology for significant vehicle performance/weight reduction enhancements. The MAV concept and its CONOPS are built on experience by Aerojet, Raytheon and Avaliant and employ a single stage mono propellant design. The proposal takes advantage of the vast experience of the team members from programs such as VIKING, Sidewinder, and AMRAAM, missile guidance algorithm design, communications and health monitoring systems engineering. This single-stage, liquid monopropellant MAV concept leverages recent component advancements resulting from over $500 million in investment by the Missile Defense Agency in miniature interceptor component technology.

Primary U.S. Work Locations and Key Partners



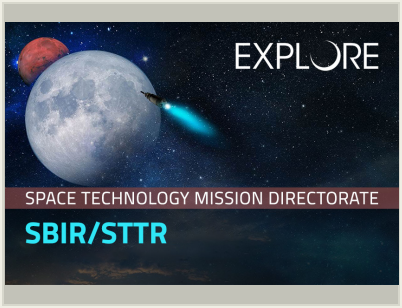


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Table of Contents

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
Microcosm, Inc.	Lead Organization	Industry Women-Owned Small Business (WOSB)	Hawthorne, California
Jet Propulsion Laboratory(JPL)	Supporting Organization	NASA Center	Pasadena, California

Primary U.S. Work Locations
California

Project Transitions

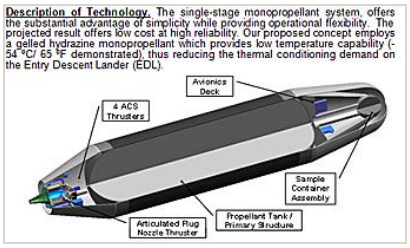
June 2015: Project Start

December 2015: Closed out

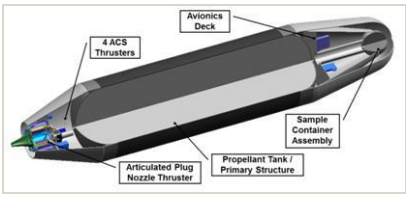
Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/139458)*

Images



Briefing Chart
Single-Stage, Gelled Hydrazine System for Mars Ascent Vehicle Propulsion Briefing Chart *(https://techport.nasa.gov/image/128940)*



Final Summary Chart Image
Single-Stage, Gelled Hydrazine System for Mars Ascent Vehicle Propulsion, Phase I Project Image *(https://techport.nasa.gov/image/125896)*

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
Microcosm, Inc.

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

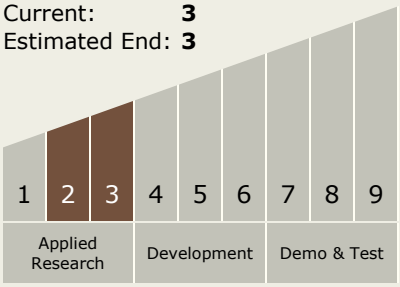
Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Markus Rufer

Technology Maturity (TRL)

Start: **2**
Current: **3**
Estimated End: **3**



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Completed Technology Project (2015 - 2015)

Technology Areas

Primary:

- TX01 Propulsion Systems
  - TX01.1 Chemical Space Propulsion
    - TX01.1.6 Gels

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System